

# CAREERS FOR COLORADO'S NEW ENERGY ECONOMY

Energy Efficiency • Wind • Solar • And More



*Governor's*  
**Energy Office**



**ENVIRONMENTAL DEFENSE FUND**

finding the ways that work

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The Governor's Energy Office's (GEO) mission is to lead Colorado to a New Energy Economy by advancing energy efficiency and renewable, clean energy resources. For more information, please visit <http://www.colorado.gov/energy>.

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# Introduction

In this difficult economy, Coloradans are looking for high quality, rewarding careers that provide financial stability. This guidebook focuses on one area of opportunity: careers in Colorado's New Energy Economy.

"We in Colorado have made developing a New Energy Economy a top priority these past few years. We're creating thousands of new jobs, attracting countless new companies, and leading America toward a new, more diverse and more secure energy future."

- Colorado Governor Bill Ritter<sup>1</sup>

Our state is a nationwide leader in renewable energy research and deployment, and a broad array of dynamic clean energy and green technology companies call Colorado home. Many Coloradans are already hard at work performing energy audits that help homeowners save money; designing and manufacturing high-performance, energy efficient windows; or building wind farms that can power thousands of homes. And despite the economic downturn, many of our New Energy Economy companies are continuing to grow and hire new employees.

These jobs are an opportunity for workers, urban or rural, highly skilled or entering the job market for the first time, to build a high quality, full time career. 400 foot wind turbines must be manufactured close to their future homes. Careers improving the energy efficiency of Colorado homes and businesses cannot be outsourced overseas. These careers are a new opportunity to build a strong, long lasting foundation for Colorado's middle class, both now and into the future.

## What careers are available in Colorado's New Energy Economy?

In many cases, a clean energy or green technology job requires the same skills and training as a job in manufacturing, installation, fabrication or operations; it just applies those skills to the growing field of clean energy and green technology. Electricians can use their knowledge to install solar photovoltaic panels, while machinists can use their skills to manufacture wind turbine components.

Equally important, these opportunities are available throughout Colorado. Companies may hire workers to manufacture wind turbines on the Front Range at the same time that construction and maintenance employees are needed to build and staff turbines operating on the wind-swept Eastern Plains.

## What information can I find in this guidebook?

This guidebook is a tool for anyone interested in learning more about careers in Colorado's New Energy Economy. In this book, you can find descriptions of dozens of different jobs in clean energy, energy efficiency and climate solution sectors. These job profiles provide an initial sampling of the kinds of careers available in Colorado's New Energy Economy. However, this list is by no means comprehensive: there are numerous sectors and even more career paths available in clean energy and green technology fields.

Each profile also includes information on the training and educational requirements of each job and on potential compensation. Of course, for every job the background requirements and salary will vary widely based on a number of factors. Compensation levels in particular will depend on factors like location and experience. These details are offered only as indicators to give a sense of the job market.

Information for these job profiles was primarily compiled from the Governor's Energy Office report, "Defining, Estimating, and Forecasting the Renewable Energy and Energy Efficiency Industries in the U.S. and Colorado," and the "Green Jobs Guidebook," authored by Environmental Defense Fund in partnership with the Ella Baker Center for Human Rights.<sup>2</sup>

### **Where can I find additional information on job training and placement?**

For those looking for additional information, the Governor's Energy Office website contains a wide range of resources on green jobs in Colorado, available here:

<http://www.colorado.gov/energy/index.php?/resources/category/colorado-green-jobs/>

For job-seekers interested in jump-starting their path towards a high quality New Energy Economy career, a variety of professional training and job placement programs are available in Colorado that can help you land a job and reach professional goals. The Governor's Energy Office website details training and job placement assistance resources in different regions in Colorado. For more information, visit:

<http://www.colorado.gov/energy/index.php?/resources/category/green-jobs-resources/>

New and returning workers can use this handbook with these additional resources to identify potential careers and find the training and job placement assistance to help land the job. Together, these resources can help job-seekers find a career in Colorado's New Energy Economy.

# Energy Efficient Construction

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A cornerstone of building Colorado's New Energy Economy will be retrofitting inefficient existing buildings as well as constructing new, energy efficient buildings. Energy efficient building practices are time and labor intensive, creating job opportunities for a variety of careers, from electricians or engineers, to roofers or architects. Many of these careers are open to workers without college degrees.<sup>3</sup> The Colorado Governor's Energy Office estimated that the largest number of jobs created in the renewable energy and energy efficiency sectors in Colorado will be related to energy efficient construction<sup>4</sup> and that by 2030, energy efficient construction may account for up to 30% of all energy efficiency-related jobs in Colorado.<sup>5</sup>

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## Lighting & HVAC Energy Engineer

**Description:** Provide a full range of technical services related to energy efficiency, renewable energy, carbon emissions reductions and cogeneration projects

**Average Salary:** \$77,000/year

**Min. Educational Req.:** Bachelor's Degree in Engineering or related field

**Recommended College Coursework:** Engineering, Energy Efficient Building, HVAC and Lighting systems, Green Building Design

**Experience Needed:** Mid to High Level  
Minimum 3 years of energy engineering experience in the identification and evaluation of energy efficient measures

**Employer Type:** Private Firms

**Related Careers:**  
1. Energy Engineer

## HVAC Engineer

**Description:** Design and install all types of air conditioning, heating and ventilation systems, building automation systems and hot water heating

**Average Salary:** \$78,000/year

**Min. Educational Req.:** Trade School, Apprenticeship or Associate's Degree

**Recommended Coursework:** Mechanical Engineering, HVAC controls

**Experience Needed:** High Level  
Journey Level plus 5 years related experience.

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**  
1. Refrigeration Engineer  
2. Energy Engineer  
3. HVAC Service Technician

## Senior HVAC Engineer

**Description:** Coordinate HVAC equipment, ductwork and piping layouts with architectural/structural designs to prevent conflict during construction; help ensure compliance with relevant building codes

**Average Salary:** \$90,000/year

**Min. Educational Req.:** Bachelor of Science in Mechanical Engineering

**Recommended College Coursework:** Mechanical Engineering, HVAC, Building Design

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
10 years working with a consulting engineering firm as an HVAC engineer, or with a design-build mechanical contractor

**Employer Type:** Private Firms

**Related Careers:**  
1. Environmental Construction Engineer

## HVAC Maintenance/Repair Trainee

**Description:** Install and maintain heating, ventilation, and air conditioning equipment; test and repair environmental systems and repair or replace sealants, parts, and components

**Average Salary:** \$32,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry level

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**  
1. HVAC Technician  
2. HVAC Engineer

# Energy Efficient Construction

## HVAC Service Technician

**Description:** Maintain and repair all types of air conditioning, heating and ventilation systems

**Average Salary:** \$49,000/year

**Min. Educational Req.:** Trade School, Apprenticeship, or Associate's Degree

**Recommended Coursework:** HVAC controls

**Certification:** EPA HVAC certification  
Commercial HVAC if necessary

**Experience Needed:** Mid-Level

## Industrial Energy Field Auditor

**Description:** Conduct energy audits of industrial areas by visually checking HVAC equipment, ducts, windows and weather-stripping and by capturing data for future use

**Average Salary:** \$24,000/year

**Min. Educational Req.:** Bachelor's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

**Recommended College Coursework:** Environmental Studies, Industrial Operations

**Experience Needed:** Mid-Level  
2 – 3 years in related field of auditing and/or energy efficiency sector

**Employer Type:** Private Firms

## Residential Energy Field Auditor

**Description:** Conduct home energy audits in residential homes by visually checking HVAC equipment, lighting, ducts, windows and weather-stripping, and by identifying areas for improvement and making recommendations to homeowner

**Average Salary:** \$24,000/year

**Min. Educational Req.:** Associate's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

**Recommended Coursework:** Environmental Studies, Energy Management, Auditing

**Certification:** HERS Certification

**Desired Education:** Bachelor's Degree preferred

**Experience Needed:** Entry to Mid-Level

**Employer Type:** Private Firms, Public Utilities

### **Related Careers:**

1. Auditing Services Sales Consultant
2. Energy efficiency consultant

## Commercial Energy Field Auditor

**Description:** Conduct energy audits in commercial businesses by visually checking HVAC equipment, lighting, ducts, windows and weather-stripping, capturing data for future use, identifying areas of improvement, and making recommendations to business

**Average Salary:** \$24,000/year

**Min. Educational Req.:** Associate's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

**Recommended Coursework:** Energy Management, Building Materials

**Certification:** HERS Certification

**Desired Education:** Bachelor's Degree preferred

**Experience Needed:** Entry to Mid-Level

**Employer Type:** Private Firms, Public Utilities

### **Related Careers:**

1. HVAC Technician
2. Energy efficiency consultant

## **Employer Example: Johns Manville Corporation, Denver, CO**

Johns Manville, a Denver-based company, demonstrates the wide variety of careers available in the Green Buildings sector. Johns Manville is an international manufacturer of building products with a range of business units, from manufacturing energy efficient roofing systems and insulation to research and design of new products.<sup>6</sup> The company, an EPA Energy Star partner, helped retrofit and insulate the new offices for the Colorado Governor's Energy Office as part of Governor Ritter's 'Greening Government' goals.<sup>7</sup> Johns Manville facilities in Colorado include its World Headquarters and an Insulation Systems center in Denver, as well as its Technical Center for product research and development in Littleton. Careers at these three facilities include jobs in sales, product manufacturing, and research and design.<sup>8</sup> In total the company employs about 700 people throughout Colorado—a portion of its approximately 7,500 worldwide employees.<sup>9</sup>

# Energy Efficient Construction

## Auditing Services Sales Consultant

**Description:** Establish sales plans, prepare proposals and close client deals

**Average Salary:** \$60,000/year

**Min. Educational Req.:** Bachelor's Degree

**Recommended College Coursework:** Marketing, Sales, Sciences

**Experience Needed:** Mid-Level  
2-5 years experience in commercial and/or in-home sales

**Employer Type:** Private Firms

**Related Careers:**  
1. Energy Conservation Representative

## Energy Conservation Representative

**Description:** Inspect homes of utility customers to identify conditions that cause energy waste and suggest actions to reduce waste

**Average Salary:** \$48,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry to Mid-Level  
1-3 years related experience

**Employer Type:** Private Firms, Government

**Related Careers:**  
1. Environmental Compliance Specialist  
2. Energy Control Officer

## Field Energy Consultant

**Description:** Identify opportunities for equipment and energy system retrofits at grocery stores and other retail sites

**Average Salary:** \$60,000/year

**Min. Educational Req.:** HS Diploma/GED

**Recommended College Coursework:** Marketing & Sales, HVAC, Mechanical Engineering

**Experience Needed:** Entry Level  
1 – 2 years with consultant sales background and experience building a portfolio of clients

**Desired Education:** Familiarity with HVAC, lighting and/or refrigeration

**Employer Type:** Private Firms

**Related Careers:**  
1. Sales Representative

## Residential Green Building & Retrofit Architect

**Description:** Design residential buildings that meet LEED qualifications as well as develop retrofits for current structures

**Average Salary:** \$91,000/year

**Min. Educational Req.:** Bachelor's Degree in Architecture

**Recommended College Coursework:** Architecture, Civil Engineering, Drafting, Retrofitting

**Certification:** LEED-accredited professional

**Experience Needed:** High Level

**Employer Type:** Private Firms

**Related Careers:**  
1. Civil Engineer

## Industrial Green Systems & Retrofit Designer

**Description:** Design energy efficient and retrofit structures for industrial buildings

**Average Salary:** \$91,000/year

**Min. Educational Req.:** Bachelor's Degree in Architecture

**Recommended College Coursework:** Architecture, Industrial Building

**Certification:** LEED-Certified Builder

**Experience Needed:** High Level  
5-8 years experience

**Employer Type:** Private Firms

**Related Careers:**  
1. Structural Engineer

## Commercial Green Building & Retrofit Architect

**Description:** Participate in all phases of design for commercial and educational buildings

**Average Salary:** \$91,000/year

**Min. Educational Req.:** Bachelor's Degree in Architecture

**Recommended College Coursework:** Architecture, Drafting, Energy Efficiency

**Certification:** LEED-Certified Builder

**Experience Needed:** High Level  
Minimum 5 years experience

**Employer Type:** Private Firms

**Related Careers:**  
1. Civil Engineer



# Energy Efficient Construction

## Energy Procurement Manager & Analyst

**Description:** Analyze energy efficient measures and conduct audits in industrial and large commercial facilities

**Average Salary:** \$83,000/year

**Min. Educational Req.:** Bachelor's Degree in Energy Analysis, Sciences or Business Administration

**Recommended College Coursework:** Business Administration, Sciences, Energy Analysis, Energy Efficiency methods

**Experience Needed:** Mid to High Level  
3-5 years as an energy analyst in an energy efficiency technical discipline

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Field Energy Consultant
2. Energy Conservation Representative

## Energy Efficiency Finance Manager

**Description:** Project-management role in energy efficiency projects and policies, also conducts relevant market analysis and research

**Average Salary:** \$83,000/year

**Min. Educational Req.:** Bachelor's Degree in Accounting, Finance, Business Administration

**Recommended College Coursework:** Economics, Environmental Studies, Public Policy, Finance, Accounting

**Experience Needed:** High Level  
8 or more years in related field with supervisory responsibilities

**Desired Education:** MBA

**Employer Type:** Private Firms

**Related Careers:**

1. Financial Officer

## Site Supervising Technical Operator

**Description:** Manage and ensure uniform application and technical correctness during construction

**Average Salary:** \$45,000/year

**Min. Educational Req.:** College degree in Engineering or related field

**Recommended College Coursework:** Mechanical/ Electrical Engineering

**Experience Needed:** Mid to High Level  
Minimum 5 years experience in a supervisory role

**Employer Type:** Private Firms

**Related Careers:**

1. Safety Technical Specialist

## Field Technician

**Description:** Install, maintain and repair facilities; can also include commissioning advanced energy management and control systems, controls programming and controls sales

**Average Salary:** \$57,000/year

**Min. Educational Req.:** Trade School or Apprenticeship

**Experience Needed:** Entry to Mid-Level  
Master or Journey level. Should have HVAC, electrical and or automation and controls installation and service experience  
1-3 years of related experience and/or training; or equivalent combination of education and experience

**Employer Type:** Private Firms, Government, Power Plants/Facilities

## Residential Air Sealing Technician

**Description:** Develop and implement effective air sealing techniques and applications

**Average Salary:** \$31,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
Residential construction or work on an insulation crew is a plus

**Desired Education:** Trade School or Apprenticeship

**Employer Type:** Private Firms

**Related Careers:**

1. HVAC Trainee

## Insulation Installer

**Description:** Responsible for pasting, wiring, taping or spraying insulation onto a variety of structures and surfaces to exclude or retain heat

**Average Salary:** \$20,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
1-3 month related experience

**Employer Type:** Private Firms

**Related Careers:**

1. Carpenter

# Energy Efficient Construction

## Machinist

**Description:** Make precision metal or plastic parts, operate computer numerically controlled machine tools, and set up and operate all of the basic machine tools and many specialized variations

**Average Salary:** \$30,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Metalworking, Drafting, Math and Computer courses

**Experience Needed:** Mid-Level  
Journey level status

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Welder
2. Sheet Metal Worker

## Welder

**Description:** Operate manual, semiautomatic, and automatic arc and gas equipment, and fabricate and repair machine parts, motors, trailers and manufacturing equipment

**Average Salary:** \$30,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Welding, Machine Shop, Math, Drafting, Physics, Chemistry, and Engineering

**Certification:** Various certifications dealing with different materials and uses

**Experience Needed:** Entry to Mid-Level

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Machinist
2. Sheet Metal Worker

## Home Improvement Retrofit Trainee

**Description:** Install energy efficient products for in-home retrofits, run safety tests on gas appliances and identify home energy reduction measures

**Average Salary:** \$30,000/year

**Min. Educational Req.:** High School Diploma/GED

**Experience Needed:** Entry Level  
Experience in door, window, sheetrock repair and replacement helpful

**Employer Type:** Private Firms

**Related Careers:**

1. HVAC Maintenance Trainee
2. Environmental Compliance Specialist

## Carpenter

**Description:** Work in almost every type of construction: jobs include reading plans, identifying and locating materials, measuring and marking, assembly and installation, and operating hand tools and power equipment.

**Average Salary:** \$35,000 - \$40,000/year depending on experience

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Math, Drafting, and Shop courses

**Experience Needed:** Entry to Mid-Level  
Journey Level status

**Employer Type:** Private Firms

**Related Careers:**

1. Roofers

## Roofing & Skylight Installer

**Description:** Install skylights and other energy efficient roof ventilation systems

**Average Salary:** \$53,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Carpentry, Roofing, Energy Efficiency

**Experience Needed:** High Level  
5-7 years related roofing and framing experience

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Carpenters

## Electrical System Installer

**Description:** Plan, lay out, install, repair, and maintain electrical equipment that provides light, heat, communications and power, and install electrical wires, cables and conduit systems

**Average Salary:** \$44,000/year

**Min. Educational Req.:** Apprenticeship or Trade Schools

**Recommended Coursework:** Electric Installation courses

**Experience Needed:** Mid-Level  
Journey Level status

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Lighting Engineer

# Energy Efficient Construction

## Water Systems Designer & Engineer

**Description:** Design and install energy efficient water systems in residential and commercial settings

**Average Salary:** \$37,000/year

**Min. Educational Req.:** Trade School or Apprenticeships

**Recommended Coursework:** Plumbing, Pipefitting, Energy Efficiency, Mechanical Engineering

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** Mid-Level

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Plumber

## Green Plumber & Pipefitter

**Description:** Install sinks, tubs, and other fixtures and their connection to water and sewage systems; maintain existing plumbing systems

**Average Salary:** \$60,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Plumbing, Pipefitting, Energy Efficiency

**Experience Needed:** Mid-Level  
Journey Level status

**Employer Type:** Private Firms, Government

**Related Careers:**

1. Water Purification

## Weatherization Operations Manager

**Description:** Manage day-to-day weatherization activities to ensure that production goals are met, and supervise the activities of Installers, Assessors and Weatherization office staff

**Average Salary:** \$80,000/year

**Min. Educational Req.:** None Specified

**Experience:** High Level  
2 yrs experience in construction supervision and/or management. Technical and functional skills in building trades

**Employer Type:** Private Firms

**Related Careers:**

1. Construction Foreman

## Building Maintenance Engineer

**Description:** Effectively and efficiently operate and maintain all HVAC and MEP equipment, serve as a systems operator and perform and supervise maintenance work

**Average Salary:** \$65,000/year

**Min. Educational Req.:** HS Diploma/GED, Trade School or Apprenticeship

**Recommended Coursework:** HVAC Maintenance, Energy Auditing

**Experience Needed:** Entry to Mid-Level  
2-3 years experience in commercial HVAC and in operating large tonnage chill plant

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. HVAC Engineer

## Employer Example: Alpen Energy Group, Boulder, CO

Alpen Energy Group LLC is a major producer of high performance insulating windows for office buildings, schools, shopping malls, and home residences. The company's fiberglass windows were named one of 2007's Top Ten Green Building Products by BuildingGreen.<sup>10</sup> Alpen's energy efficient windows have been installed at the Jefferson County Courthouse, the Boulder Public Library, and the Loveland City Center, among many other locations in Colorado and worldwide.<sup>11</sup> In recent years, the company has experienced steady, rapid growth, with annual revenue increasing by at least 60% in 2006, 2007, and 2008.<sup>12</sup> The 28 year old company employs approximately 25 full time staff members in Colorado, working in sales, design and manufacturing.<sup>13</sup>

# Energy Efficient Construction

## Energy Consultant

**Description:** Assess industry trends and related implications, monitor product developments and preferences, explore competitive landscapes and examine emerging technologies

**Average Salary:** \$81,000/year

**Min. Educational Req.:** Advanced Degree

**Recommended College Coursework:** Energy, with focus on any or all efficient technologies and practices

**Experience Needed:** High Level

**Employer Type:** Private Firms, Government, Education

**Related Careers:**

1. Environmental Scientist

## Civil Engineer

**Description:** Oversee design, construction and maintenance of green buildings; work with project managers to build projects within design specifications

**Average Salary:** \$72,000/year

**Min. Educational Req.:** Bachelor's degree in Civil Engineering

**Recommended College Coursework:** Engineering, Land Use, Green Building

**Certification:** Professional Engineer (PE) or Engineer in Training (E.I.T.)

**Desired Education:** Master's Degree

**Experience Needed:** High Level  
Most projects require experience of 2 – 5 years

**Employer Type:** Private Firms, Government

**Related Careers:**

1. Energy Efficient Engineer
2. Construction

## Environmental Construction Engineer

**Description:** Project manager for an environmental construction project

**Average Salary:** \$115,000/year

**Min. Educational Req.:** Bachelor's Degree in Civil Engineering

**Recommended College Coursework:** Environmental Construction, Civil Engineering

**Certification Requirements:** Licensed Civil Engineer

**Experience Needed:** High Level  
12 plus years experience in civil engineering with at least 5 years experience in a management role

**Employer Type:** Private Firms, Government

## Refrigeration Engineer

**Description:** Design and install refrigeration units and maintain and repair controls

**Average Salary:** \$74,000/year

**Min. Educational Req.:** Bachelor's Degree in Engineering or equivalent Trade School/Apprenticeship

**Recommended College Coursework:** Mechanical Engineering, Refrigeration controls

**Experience Needed:** Mid to High Level

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. HVAC Engineer

## Energy Engineer

**Description:** Perform site-specific engineering analysis and evaluation of energy efficiency involving residential, commercial and industrial customers by using building simulation software

**Average Salary:** \$71,000/year

**Min. Educational Req.:** Bachelor's Degree in engineering discipline

**Recommended College Coursework:** Engineering, Physics

**Certification Requirements:** Professional Engineer, Engineer-In-Training, and/or Certified Energy Manager (CEM) desired.

**Experience Needed:** High Level  
3-10 years related experience or training or equivalent combination of education and experience or 2-5 years of experience within the green building, energy efficiency, building science or related field

**Desired Education:** Master's degree a plus

**Employer Type:** Private Firms

## Engineering Intern

**Description:** Assist Electrical Engineer with LEED certification projects

**Average Salary:** \$6,000/year

**Min. Educational Req.:** HS Diploma/GED, Some College

**Recommended College Coursework:** Physics, Electrical Engineering

**Experience Needed:** Entry Level  
Hands-on laboratory experience with electronics equipment, physics laboratory, optical equipment and electronics fabrication

**Desired Education:** Working for B.S. or M.S. degree in Physics or Electrical Engineering

**Employer Type:** Private Firms

# Energy Efficient Construction

## Electrical Engineer

**Description:** Electrical Engineer with a LEED-certified, sustainable, Green-building MEP and Architectural firm

**Average Salary:** \$72,000/year

**Min. Educational Req.:** Bachelor's degree in Electrical Engineering

**Recommended College Coursework:** Electrical Engineering

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High level  
4-7 years Electrical Engineering experience in an MEP or construction firm

**Employer Type:** Private Firms

**Related Careers:**

1. Civil Engineer

## Structural Design Engineer

**Description:** Analyze and design structural elements and systems for buildings in accordance with building code and design standards; prepare construction documents and specifications for structural systems

**Average Salary:** \$75,000/year

**Min. Educational Req.:** Master's Degree in Structural Engineering

**Recommended College Coursework:** Structural and Seismic Engineering

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
3-6 years experience and competence in structural analysis programs

**Employer Type:** Private Firms, Government

# Wind Power

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Colorado has already established itself as a leader in U.S. wind power generation and manufacturing, creating jobs along the entire wind power supply chain.

Colorado hosts some of the largest wind farms in the United States and also has world class wind resources available for further development. Colorado's numerous wind farms on the Eastern Plains create construction and project design jobs when the enormous wind turbines are installed, as well as long-term operation and maintenance jobs overseeing the wind farm. Colorado's windy plains host numerous opportunities for further wind power development: in 2007, eight new Renewable Resource Generation Development Areas were identified in-state with the potential for development of over 96 GW of wind power capacity, eight times Colorado's current peak electricity use.<sup>14</sup>

Colorado's leadership in wind power has encouraged major wind manufacturers to locate in-state. Most notably, Vestas, a leading wind turbine manufacturer, is in the process of opening four major factories in Colorado: a blade factory in Windsor, a tower factory in Pueblo, and a blade factory and nacelle factory in Brighton.<sup>15</sup> Vestas expects to employ 2,500 people in Colorado by the end of 2010.<sup>16</sup> Numerous other wind firms, from Siemens Wind Power, a wind turbine manufacturer, to Hexcel Corporation, a wind turbine component supplier, are also locating in Colorado and creating job opportunities in wind turbine design, manufacturing, and sales.

The wind power sector is a major employer in Colorado.<sup>17</sup> Proposed and under construction manufacturing facilities along the Front Range as well as further wind development on the Eastern Plains will create additional opportunities in this sector.

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## Wind Turbine Sheet Metal Worker

**Description:** Perform all operations necessary to make, install and repair a wide variety of sheet-metal products related to wind turbine production

**Average Salary:** \$33,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Math, Mechanical Drawing, Metal Shop, Welding, Heating and Air-Conditioning

**Experience Needed:** Entry to Mid-Level  
Journey level status

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Machinist
2. Welder

## Wind Turbine Electrical Engineer

**Description:** Responsible for design, development and testing of all aspects of electrical components and equipment.

**Average Salary:** \$87,000/year

**Min. Educational Req.:** Bachelor's Degree in Electrical Engineering

**Recommended College Coursework:** Electrical Engineering, Renewable Energies

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
5 years with similar responsibilities

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Energy Engineer
2. Photovoltaic Design Engineer

# Wind Power

## Wind Turbine Machinist

**Description:** Make precision metal or plastic parts, use computer numerically controlled machine tools and set up and operate all of the basic machine tools and many specialized variations for wind turbine production

**Average Salary:** \$30,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended Coursework:** Metalworking, Drafting, Math, and Computer courses

**Experience Needed:** Entry to Mid-Level Journey level status

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Welder
2. Sheet Metal Worker

## Wind Power Plant Project Engineer

**Description:** Responsible for overseeing all aspects of the technical specialties at plants including electrical engineering, turbine selection & procurement, revenue generation, expense management and budgets, as well as conducting conceptual engineering and design of wind field processes and facilities

**Average Salary:** \$69,000/year

**Min. Educational Req.:** Bachelor's degree in Mechanical or Electrical Engineering.

**Recommended College Coursework:** Mechanical and/or Electrical Engineering, Renewable Energies

**Experience Needed:** High Level  
5-10 years of experience with power plant design, maintenance and operations

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Director of Wind Development

## Wind Turbine Mechanical Engineer

**Description:** Responsible for design, development, testing of all aspects of mechanical components, equipment and machinery.

**Average Salary:** \$87,000/year

**Min. Educational Req.:** Bachelor's Degree in Mechanical Engineering

**Recommended College Coursework:** Mechanical Engineering, Metal Shop, Machinery

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
5 years with similar responsibilities

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Energy Engineer

## Director of Wind Development

**Description:** Lead and manage the development and evaluation of potential wind energy business opportunities; identify and analyze wind energy investment opportunities; and lead projects through the research, analysis, modeling, recommendation and negotiating phases

**Average Salary:** \$138,000

**Min. Educational Req.:** Bachelor's degree in Accounting, Finance, Economics, or related field

**Recommended College Coursework:** Finance, Economics, Accounting, Management

**Experience Needed:** High Level  
4-6 years wind developer experience with large company or consulting firm

**Desired Education:** MBA, CPA, CMA

**Employer Type:** Private Firms, Power Plants/Facilities

## **Employer Example: Hexcel Corporation, Windsor, CO**

Hexcel Corporation is a leading manufacturer of the advanced composite materials that are an important part of today's giant wind turbines.<sup>18</sup> In February 2009, Hexcel broke ground on a 100,000 square foot manufacturing facility in east Windsor that the company expects will begin production in the second half of 2009.<sup>19</sup> An example of the ripple effect of renewable energy development, this facility will supply component parts and materials to Vestas, a wind manufacturer which recently opened a turbine plant in Windsor.<sup>20</sup> Vestas' continued expansion increases the likelihood that additional component suppliers like Hexcel will locate in Colorado, providing more job opportunities for Coloradans. Production of wind turbine components requires similar qualifications as other skilled manufacturing careers, with positions including machinists, engineers and quality control managers.<sup>21</sup>

# Wind Power

## Wind Farm Electrical Systems Designer

**Description:** Design underground and overhead wind farm collector systems and prepare and develop site specifications.

**Average Salary:** \$60,000/year

**Min. Educational Req.:** Bachelor's Degree

**Recommended College Coursework:** Electrical Systems, Wind Turbine Design

**Experience Needed:** High Level  
Minimum 5 years experience including wind farm collector systems and/or electric utility distribution

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Electrical Engineer

## Wind Field Operations Manager

**Description:** Provide overall leadership to drive execution of all site activities - receiving, installation & commissioning - while maintaining expertise in environmental, health, safety and quality procedures and ensuring project goals including cost, schedule and performance

**Average Salary:** \$48,000/year

**Min. Educational Req.:** Bachelor's Degree

**Recommended College Coursework:** Renewable Energies, Engineering, Industrial Operations

**Experience Needed:** Mid to High Level  
Minimum 3 years in field management of wind farms plus 1-2 years direct technical experience on wind farms

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Plant Operations Manager

## Electro-Mechanical Wind Turbine Technician

**Description:** Responsible for the installation, maintenance and commissioning of wind turbines

**Average Salary:** \$35,000/year

**Min. Educational Req.:** Associate's degree or equivalent from Trade School  
OR, six months to one year related experience and/or training  
OR, equivalent combination of education and experience

**Recommended College Coursework:** Electrical/ Mechanical Engineering

**Experience Needed:** Entry to Mid-Level

**Employer Type:** Private Firms, Government, Power Plant/Facilities

**Related Careers:**

1. Wind Generating Installer
2. Wind Field Technician

## Wind Field Technician

**Description:** Troubleshoot and repair complex problems on variable speed/variable pitch wind turbines

**Average Salary:** \$26,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
1-2 years experience desired

**Desired Education:** Basic math skills in all units of measure using whole numbers, common fractions and decimals

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Electro-Mechanical Wind Turbine Technician
2. Wind Generating Installer

## Wind Field Service Technician

**Description:** Perform status checks on turbines and repair any problems

**Average Salary:** \$44,000/year

**Min. Educational Req.:** Trade School or Apprenticeship

**Recommended College Coursework:** Iron and/or Metal shop, Mechanical/Electrical Engineering, Renewable Energy Studies

**Experience Needed:** Mid-Level

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Electro-Mechanical Wind Turbine Technician

## Wind Generating Installer

**Description:** Assemble, install, and maintain electrical and mechanical parts, such as alternators, generators, and rotors of electric power generating windmills, according to production specifications

**Average Salary:** \$31,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry to Mid-Level  
A combination of more than 4 years of directly related training and/or experience is typically required

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Electro-Mechanical Wind Turbine Technician
2. Wind Field Technician



# Wind Power

## Junior Renewable Energy Technician

**Description:** Perform wind turbine resets and site call outs and act as a central safety call in for project managers performing high voltage switching, while receiving on-site training

**Average Salary:** \$30,000/year

**Min. Educational Req.:** No degree required

**Recommended College Coursework:** Electro-Mechanical, Wind Power Generation

**Experience Needed:** Entry Level  
Previous operations experience of wind plants or currently attending school for this particular field

**Desired Education:** Trade School or Apprenticeship

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Wind Field Technician
2. Electro-Mechanical Wind Turbine Technician

# Solar Power

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The solar power sector has great potential in sunny Colorado. In recent years, the solar sector has been one of the fastest growing renewable energy sectors in Colorado.<sup>22</sup> For example, Abound Solar Inc., a solar panel manufacturing company that got its start in a Colorado State University laboratory, is currently constructing a manufacturing plant in Northern Colorado that the company predicts will bring its Colorado employee total to as many as 500 people.<sup>23</sup> Ascent Solar recently opened its world headquarters and enlarged manufacturing facilities in Thornton while Abengoa, a Spanish renewable energy company, recently established the North America headquarters of its solar power division in Lakewood.<sup>24</sup> Across Colorado, numerous companies design and install residential and commercial solar power systems, creating additional exciting career opportunities. Continued support for solar power and Colorado's top-notch solar resources are likely to lead to further opportunities in the solar power sector.

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## Solar Energy System Installer

**Description:** Install and repair solar energy systems designed to collect, store and circulate solar-heated water or other medium for residential, commercial or industrial use

**Average Salary:** \$31,000/year

**Min. Educational Req.:** HS Diploma/GED

**Certification:** Solar Thermal Installer recommended

**Experience Needed:** A combination of more than 2 years of directly related training

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Cell Device Technician
2. Electrician

## Solar Energy System Installer Assistant

**Description:** Assist solar energy system installer in installing and repairing solar energy systems for residential, commercial or industrial use

**Average Salary:** \$23,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Fabrication Technician
2. Solar Energy System Installer

## Solar Residential Installation Electrician

**Description:** Hardwire the PV energy system to the power grid

**Average Salary:** \$44,000/year

**Min. Educational Req.:** HS Diploma/GED

**Certification:** North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

**Experience Needed:** Entry to Mid-Level  
Assumes Journey level Electrician but does not need solar experience

**Desired Education:** Associate's Degree, Trade School or Apprenticeship

**Employer Type:** Private Firms, Government

**Related Careers:**

1. Electrician

## Solar Residential Installation Electrician Foreman

**Description:** Coordinate, direct and manage solar electric generating systems at residential customer sites

**Midrange Salary:** \$25-\$40/hour

**Min. Educational Req.:** HS Diploma/GED

**Recommended Certification:** North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

**Experience Needed:** Mid to High Level  
Journey Level Attained - Minimum 3-5 years of Solar Installation

**Desired Education:** Associate's Degree or equivalent from Trade School or Apprenticeship

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Energy System Installer
2. Commercial Installation Electrician

# Solar Power

## Solar Commercial Installation Electrician Foreman

**Description:** Coordinate, direct and manage solar electric generating systems at commercial customer sites

**Average Salary:** \$58,000/year

**Min. Educational Req.:** Trade School or Apprenticeship

**Recommended Coursework:** Solar or Renewable Energy Classes

**Certification:** North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

**Experience Needed:** Mid to High Level  
Journey Level Attained - 3 -5 years direct experience in a construction environment in a similar capacity and carpentry and/or roofing experience is required

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Residential Installation Electrician

## Solar Commercial Installation Engineer

**Description:** Responsible for installing solar panel systems on commercial structures. Works with blueprints and technical concerns in installation

**Average Salary:** \$75,000/year

**Min. Educational Req.:** Bachelor's Degree in Electrical Engineering

**Recommended College Coursework:** Solar, Electrical Engineering

**Recommended Certification:** North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

**Experience Needed:** High Level  
Established Engineer with experience in Solar Installation

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Residential Installation Engineer
2. Electrical Engineer

## Solar Commercial Installation Electrician

**Description:** Install solar electric generating systems at commercial customer sites

**Midrange Salary:** \$19-\$25/hour

**Min. Educational Req.:** HS Diploma/GED

**Recommended Certification:** North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

**Experience Needed:** Entry to Mid-Level  
Journey level status expected

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Energy Efficiency Electrician

## Solar Commercial Installation Engineering Technician

**Description:** Provide technical support and assistance to field technicians and engineers

**Average Salary:** \$47,000/year

**Min. Educational Req.:** Associate's degree or equivalent from Trade School or Apprenticeship

**Recommended Coursework:** Solar Installation, Electrical Engineering

**Experience Needed:** Mid-Level

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Lab Technician
2. Commercial Installation Engineer

### **Employer Example: Solar Worx, LLC, Durango, CO**

Solar Worx, a small solar company in Durango, gives a picture of the kinds of jobs available with commercial and residential solar installation companies located throughout Colorado. Solar Worx's six employees design customer-specific solar systems, help customers apply for tax credits and rebates, install photovoltaic and solar thermal systems, and offer consulting services on solar system installation.<sup>25</sup> The company is currently working on several large projects, including both solar thermal and solar PV as well as residential and commercial projects. One project is a system that will produce 32,000 Watts of energy on the roof of Mercury Payments Processing, one of the largest businesses in Durango.<sup>26</sup> Solar Worx is a relatively young company, and thus far has experienced expansive growth. As more government entities, such as schools, move towards solar, Solar Worx expects more growth in the future.<sup>27</sup>

# Solar Power

## Solar & PV Installation: Roofer

**Description:** Install solar systems on roof while ensuring that system is air-tight and does not compromise the structural integrity of building

**Midrange Salary:** \$14- \$25/hour

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
1-3 years related on-the-job experience

**Desired Education:** Trade School or Apprenticeship

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**  
1. Construction

## Solar Energy Engineer

**Description:** Perform site-specific analysis and evaluation of solar projects involving residential, commercial and industrial customers by utilizing building simulation software

**Average Salary:** \$71,000/year

**Min. Educational Req.:** Bachelor's Degree in an Engineering discipline

**Recommended College Coursework:** Engineering, Physics

**Certification:** Professional Engineer, Engineer-In-Training, and/or Certified Energy Manager (CEM) are desired

**Experience Needed:** High Level  
3-10 years related experience/training  
3-5 years of facility-related engineering experience  
2-5 years of experience within the green building, energy efficiency, building science or related field.

**Desired Education:** Master's degree

**Employer Type:** Private Firms

## Solar Operations Engineer

**Description:** Work with integration partners to design solar facilities and be an expert on solar technology and innovation

**Average Salary:** \$87,000/year

**Min. Educational Req.:** HS Diploma/GED

**Recommended College Coursework:** Electrical Engineering, Solar Operations

**Recommended Certification:** Professional Engineer (P.E.) NABCEP certificate and/or Electrical Contractors licenses

**Experience Needed:** High Level  
Have experience designing and building PV electrical generation systems

**Desired Education:** Bachelor's Degree in Electrical Engineering Preferred

**Employer Type:** Private Firms, Government, Power Plants/Facilities

## Residential/Commercial Solar Sales Consultant

**Description:** Establish sales plans, prepare proposals and close client deals

**Average Salary:** \$50,000 - \$80,000/year – varies due to commission

**Min. Educational Req.:** Bachelor's Degree

**Recommended College Coursework:** Marketing, Sales, Sciences

**Experience Needed:** Mid-Level  
2-5 years experience in commercial and/or in-home sales.

**Employer Type:** Private Firms

**Related Careers:**  
1. Energy Conservation Representative

## Solar Energy Systems Designer

**Description:** Designs solar domestic hot water and space heating systems for new and existing structures, applying knowledge of energy requirements of structure, local climatological conditions, solar technology and thermodynamics

**Average Salary:** \$47,000/year

**Min. Educational Req.:** Trade School or Apprenticeship

**Recommended College Coursework:** Shop Math, Mechanical Drawing, Physics, Electronics, Solar Theory, Design

**Experience Needed:** Mid to High Level  
Knowledge of solid-state equipment controls, microelectronics, plumbing and electrical training

**Employer Type:** Private Firms, Government, Power Plants/Facilities

## ICE Technician (Instrumentation/Controls/Electrical Systems)

**Description:** Monitor and repair the instrumentation, controls, and electrical systems in a utility scale solar power generating facility

**Average Salary:** \$35,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Mid-Level  
2-3 years experience with increasing responsibilities in troubleshooting and repair of plant instruments

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**  
1. Installation Engineer

# Solar Power

## Solar Thermoelectric Plant Project Manager

**Description:** Oversee and manage a solar thermoelectric plant

**Average Salary:** \$75,000/year

**Min. Educational Req.:** Trade School, Apprenticeship or Bachelor's Degree

**Recommended College Coursework:** Electrical, Electronic and/or Energy Engineering

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** Mid to High Level  
Minimum 2 years working experience, familiarity with thermoelectric technology as well as the solar energy market

**Employer Type:** Power Plants/Facilities

**Related Careers:**

1. Solar Operations Engineer

## PV Solar Cell Designer

**Description:** Design concentrated photovoltaic solar cells for mass production

**Average Salary:** \$77,000/year

**Min. Educational Req.:** Advanced Degree in Electrical Engineering, Materials Science, Chemistry, Physics or related

**Recommended College Coursework:** Engineering, Sciences, Renewable Energies

**Experience Needed:** High Level  
Minimum 5 years of industry experience, solar experience not required.

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Solar Energy Systems Designer
2. Electrical Engineer

## Solar Hot Water Heater Manufacturing Technician

**Description:** Manufacture solar hot water heaters.

**Midrange Salary:** \$16-18/hour

**Min. Educational Req.:** Associate's Degree in Electronics/ Electrical Engineering, Material Science, Physics, Chemistry or related discipline OR equivalent training and work experience

**Recommended College Coursework:** Engineering, Sciences, Solar Technology

**Experience Needed:** Entry Level

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. PV Fabrication and Testing Technician

## Solar Fabrication Technician

**Description:** Fabricate and assemble solar panels and arrays using machine shop tools and equipment

**Average Salary:** \$23,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
A combination of 3 – 6 months of directly related training and/or experience is typically required

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Energy System Installer
2. Solar and PV installation: Roofer

## PV Fabrication & Testing Technician

**Description:** Test and fabricate flexible, translucent plastic solar cells which generate energy from the sun

**Average Salary:** \$45,000/year

**Min. Educational Req.:** Associate's Degree in Electronics/ Electrical Engineering, Material Science, Physics, Chemistry or related discipline OR equivalent training and work experience

**Recommended College Coursework:** Electronics, Electrical Engineering, Chemistry, Solar, Physics, Material Science

**Experience Needed:** Entry Level  
2 years work experience in a laboratory environment is highly desirable

**Employer Type:** Private consulting, Government, Power Plants/Facilities

## Solar Lab Technician

**Description:** Perform a variety of tests on solar devices, examine test samples and read blueprints, diagrams, instruments and operational instructions

**Average Salary:** \$41,000/year

**Min. Educational Req.:** Associate's Degree in related field

**Recommended College Coursework:** Physics, Chemistry, Mechanical/Electrical Engineering, Solar

**Experience Needed:** Entry Level  
Demonstrated ability to perform all common laboratory tests, record lab results, and provide feedback

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Solar Energy Systems Designer
2. PV Power Systems Designer

# Recycling and Waste Management

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Every community needs sustainable options to reduce, reuse and manage their municipal waste. Because of the ubiquitous need for waste management, recycling, reuse, and remanufacturing companies employ large numbers of workers throughout the state and are one of the largest sectors of the green economy. In 2007, Colorado hosted an estimated 8,800 jobs in the recycling, reuse and remanufacturing sector.<sup>28</sup> Additional population growth and economic growth in Colorado is predicted to steadily increase employment in this sector.<sup>29</sup>

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## Recycling Collections Driver

**Description:** Drive collection route and pick up recycling from designated locations

**Average Salary:** \$20,000/year

**Min. Educational Req.:** None

**Experience Needed:** Entry Level  
Must have a driver's license

**Employer Type:** Private firms, Government

**Related Careers:**

1. Recycling Center Operator

## Recycling Center Operator

**Description:** Perform daily operations at a Recycling Center, including processing materials and customer service; hand sorts and separates recyclable from non-recyclable materials according to established procedures

**Average Salary:** \$27,000/year

**Min. Educational Req.:** None

**Experience Needed:** Entry Level  
1 year as general laborer

**Employer Type:** Private Firms, Government

**Related Careers:**

1. Recycling Collections Driver

## Hazardous Waste Management Specialist

**Description:** Conduct studies on hazardous waste management projects; provide information on treatment and containment of hazardous waste; provide technical assistance in event of hazardous chemical spill by identifying pollutant, determining hazardous impact and recommending corrective action

**Average Salary:** \$55,000/year

**Min. Educational Req.:** College Degree in Chemistry or other Science

**Recommended College Coursework:** Analytical Chemistry, Organic Chemistry, and Physical Chemistry

**Experience Needed:** Mid-Level  
2 years in a comprehensive environmental, health and safety program

**Employer Type:** Private Firms, Government, Plants/Facilities

**Related Careers:**

1. Hazardous Materials Removal Worker
2. Nuclear Waste Management Engineer

## Solid Waste Engineer / Manager

**Description:** Manage solid waste projects, including planning, operations and technology development

**Average Salary:** \$74,000/year

**Min. Educational Req.:** Bachelor's degree in Engineering or Environmental Studies

**Recommended College Coursework:** Engineering, Green building, Cogeneration, Auditing, Water efficiency

**Certification:** E.I.T. – Engineer in Training

**Experience Needed:** Mid to High Level  
2-5 years experience in performing engineering and economic analyses for energy efficiency or solid waste management projects and/or programs

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Wastewater Engineer

# Recycling and Waste Management

## Operations Maintenance Worker for Water Services

**Description:** Responsible for repairing water mains, services, general maintenance and other duties

**Average Salary:** \$36,000/year

**Min. Educational Req.:** HS Diploma/GED

**Certification Requirements:** Grade II Distribution certification desired or must have or obtain Grade II Distribution cert. within 10 months

**Experience Needed:** Entry Level

**Employer Type:** Government, Power Plants/Facilities

**Related Careers:**

1. Wastewater Engineer

## Water Resource Engineer

**Description:** Prepare environmental documentation for water resources, regulatory program compliance, data management and analysis and site reviews

**Average Salary:** \$64,000/year

**Min. Educational Req.:** Bachelor's Degree in Environmental Science/Studies, Engineering, Chemistry, Hydrology, or related field

**Recommended College Coursework:** Hydrology, Stormwater, Wastewater, Environmental Studies/ Sciences

**Experience Needed:** High Level  
Experience in water quality compliance, permitting, and associated technical document preparation

**Employer Type:** Private Firms, Government

## Wastewater Plant Civil Engineer

**Description:** Project manager for wastewater design and implementation, responsible for all facets of hydraulic modeling and pipeline design

**Average Salary:** \$72,000/year

**Min. Educational Req.:** Bachelor's Degree in Civil Engineering

**Recommended College Coursework:** Civil Engineering, Mechanical Engineering, Wastewater management

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
10 years experience in Civil Design

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Civil Engineer
2. Wastewater Plant Operator

## Wastewater Engineer in Industrial Facilities

**Description:** Administer the stormwater/wastewater program for major industrial facilities; prevent spills and stormwater pollution

**Average Salary:** \$81,000/year

**Min. Educational Req.:** Bachelor's Degree in Chemical, Petroleum, Mechanical or Environmental Engineering

**Recommended College Coursework:** Chemistry, Mechanical Engineering, Water/Waste Water treatment

**Experience Needed:** High Level  
Minimum 5 years related experience

**Employer Type:** Plants/Facilities

## **Employer Example: Curbside Recycling Indefinitely, Inc., Grand Junction, CO**

Curbside Recycling Indefinitely, Inc. (GJ CRI), is one example of the locally owned and operated recycling companies located in many communities throughout Colorado. GJ CRI offers residential curbside recycling and commercial recycling in partnership with the city of Grand Junction under the direction of the Solid Waste Management Department.<sup>30</sup> The company is experiencing steady growth in customers as well as product offerings: in 2008, GJ CRI gained 519 new residential customers, and in 2009 hopes to gain 240 more residential customers. GJ CRI is also continuing to expand its drop off recycling services and its electronics and facility infrastructure, with the objective of increasing the facility capacity from the current 3.5 million pounds of material per year to 9 million pounds per year.<sup>31</sup> The small, family-owned business provides green recycling services for the community and also provides employment for twelve local residents. With its continued expansion, GJ CRI hopes to employ two to six new employees in 2009.<sup>32</sup> Positions at GJ CRI include educational coordinator, office manager, facility manager, residential route supervisor, commercial route supervisor, residential route driver, and residential route assistant.<sup>33</sup>

# Recycling and Waste Management

## Hazardous Materials Removal Worker

**Description:** Identify, remove, transport and dispose of various hazardous materials, including asbestos, lead and radioactive and nuclear materials

**Average Salary:** \$35,000 - \$42,000/year depending on experience

**Min. Educational Req.:** HS Diploma/GED

**Certification Requirements:** 1 – 3 months of training and licensure is required for each material to be handled

**Experience Needed:** Entry Level - Need Certification

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Hazardous Waste Management Specialist
2. Nuclear Waste Management Engineer

## Waste Reduction Consultant

**Description:** Help design, implement and monitor a variety of commercial and municipal programs that include waste prevention, recycling, construction & demolition, household hazardous waste, illegal hauling and used oil programs

**Average Salary:** \$65,000/year

**Min. Educational Req.:** Bachelor's Degree in Waste Management and/or Energy Efficiency

**Recommended College Coursework:** Waste Reduction, Environmental Studies, Recycling

**Experience Needed:** High Level  
5-7 years in related experience

**Desired Education:** Master's Degree or PhD

**Employer Type:** Private Firms

**Related Careers:**

1. Environmental Consultant



# Advancing New Solutions

Colorado is a national leader in researching and developing new solutions for energy and environmental security. In particular, the National Renewable Energy Laboratory (NREL), located in Golden, provides significant employment opportunities while also developing new technologies to address pressing energy and environmental issues and stimulating the growth of renewable energy companies in Colorado.<sup>34</sup> The leadership of NREL and our other national labs, coupled with dynamic private sector companies, has made Colorado a leader in cutting edge clean energy technologies, generating jobs and opportunity throughout the state.

## Smart Grid

Creating the electricity grid of the future will increase the efficiency of our power use and help us take advantage of Colorado's renewable energy resources. It will also create new jobs and career opportunities for Colorado citizens. For example, Tendril Networks Inc., a 'smart grid' company based in Boulder, offers career opportunities in designing, manufacturing and selling equipment to help homeowners and utilities track electricity use.<sup>35</sup>

### Power System Operator

**Description:** Monitor and operate equipment on transmission lines and in transformer and power generation stations, and control the distribution and regulate the flow of electrical power in the transmission network grid

**Average Salary:** \$51,000/year

**Min. Educational Req.:** HS Diploma/GED

**Recommended Coursework:** Computer Programming, Electronics

**Experience Needed:** High Level  
3-4 years of a training program, typically in-house

**Employer Type:** Government, Power Plants/Facilities

**Related Careers:**

1. Hydro-Electric Plant Operator

### Power System Operator & Instructor

**Description:** Operate power distribution systems; design, review, evaluate and conduct training for control room personnel

**Average Salary:** \$51,000/year

**Min. Educational Req.:** HS Diploma/GED

**Certification:** NERC Reliability Authority or System Operator Certification

**Experience Needed:** High Level  
10 years of progressively responsible work experience with 5 years in control room operations and 3 years as a Senior Shift Power System Operator

**Employer Type:** Government, Power Plants/Facilities

### Energy Infrastructure Engineer

**Description:** Specialize in Transit/Rail, Highways and Bridges, Mine, Airports, and Energy Infrastructure Engineering

**Average Salary:** \$77,000/year

**Min. Educational Req.:** Bachelor's degree in Mechanical Engineering

**Recommended College Coursework:** Mechanical and Electrical Engineering, Infrastructure development

**Certification:** Certified Energy Manager (CEM), Professional Engineer License (PE)

**Experience Needed:** High Level  
4-10 years of experience in energy management/engineering

**Employer Type:** Private Firms, Government

**Related Careers:**

1. Mechanical Engineer

### Smart Grid Engineer

**Description:** Address complex problems in the electric power delivery infrastructure related to grid modernization

**Average Salary:** \$91,000/year

**Min. Educational Req.:** Advanced level of capability either through education, PhD/Master's, or equivalent experience

**Recommended College Coursework:** Electrical Engineering, Systems Control, Computer Science and Information Technology

**Experience Needed:** High Level  
Journey level status plus 2 – 5 years of related experience dealing with the technical aspects of power grids

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Electrical Engineer
2. Power Grids Planner

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## Biogas and Biomethane

Biogas and biomethane projects capture emissions from wastewater treatment facilities, animal manure, and landfills and convert these harmful emissions into valuable natural gas resources. In 2007, the National Renewable Energy Laboratory reported that there are 6 megawatts of capacity from wastewater plants and 14 megawatts from landfill gas in Colorado, enough to power approximately 15,000 households.<sup>36</sup> Further development of biogas and biomethane resources will create a variety of employment opportunities in communities across Colorado.<sup>37</sup>

### Biomass Collection, Separation & Sorting

**Description:** Collect, haul, sort and process biomass waste for distribution to biomass facilities

**Average Salary:** \$21,000/year

**Min. Educational Req.:** High School, GED

**Recommended Coursework:** Resource/Engineering, Computer Programming

**Experience Needed:** Entry Level

**Certification:** Commercial Drivers license

**Employer Type:** Private Firms, Government, Power Plants/Facilities

### Biomass Plant Operations, Engineering & Maintenance

**Description:** Designs, constructs, operates and / or maintains plants that generate electricity from the combustion of biomass

**Average Salary:** \$69,000/year

**Min. Educational Req.:** Bachelor's degree or higher in Engineering

**Recommended College Coursework:** Resource/Engineering, Computer Programming

**Experience Needed:** High Level

**Employer Type:** Private Firms, Government, Power Plants/Facilities

### Animal Waste Biomethane Gas Collection System Technician

**Description:** Responsible for operations, maintenance and repair of biomethane equipment at animal waste operations

**Average Salary:** \$41,000/year

**Min. Educational Req.:** Trade School, Apprenticeship, or Associate's Degree

**Recommended College Coursework:** Power Generation Operation, Landfill Gas Plant Operations, Chemistry

**Experience Needed:** Mid-Level  
Minimum 3 years of equipment operations experience using mechanical, electrical, instrument or control system skills

**Employer Type:** Agriculture, Consultants, Utilities

### Landfill Gas Technician

**Description:** Responsible for assisting head landfill operator in daily operations, maintenance and repair and performing landfill gas leak checks on recurring basis

**Average Salary:** \$23,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level

**Employer Type:** Landfill Facilities, Consultants

**Related Careers:**

1. Landfill gas collection system operator

### **Employer Example: Microgy, Weld County, CO**

Microgy is a developer, owner, and operator of renewable gas facilities. Using anaerobic digestion technology, Microgy extracts methane-rich biogas from animal and food industry wastes. Xcel Energy, Colorado's largest power utility, recently announced plans to work with Microgy to use animal waste and food processing residuals to make renewable natural gas for Xcel Energy's Fort St. Vrain Generating Station near Platteville.<sup>38</sup> Construction is scheduled to begin in the first half of 2010, and when complete the plant is expected to employ eight to twelve people.<sup>39</sup> Microgy is also looking to open more methane plants in Colorado in the future.<sup>40</sup> Jobs at the planned Weld County facility may include construction, finance, or ongoing operations and maintenance of the anaerobic digester installations.<sup>41</sup>

### Landfill Gas to Energy Plant Installation, Operations, Engineering and Management

**Description:** Design, construct, operate and / or maintain system that delivers landfill gas to energy facilities to produce useable fuel

**Average Salary:** \$69,000/year

**Min. Educational Req.:** Bachelor's degree or higher in Engineering

**Recommended College Coursework:** Resource/ Petroleum Engineering, Computer Programming

**Certification:** Dependent on position sought

**Experience Needed:** High Level

**Employer Type:** Private Firm, Government, Power Plants/Facilities

### Landfill Gas Collection System Operator

**Description:** Responsible for daily operations, maintenance and repair and extracting landfill gas in a proper, safe, reliable and efficient manner

**Average Salary:** \$41,000/year

**Min. Educational Req.:** Trade School, Apprenticeship or Associate's Degree

**Recommended Coursework:** Power Generation Operation, Landfill Gas Plant Operations, Chemistry

**Experience Needed:** Mid-Level  
Minimum 3 years of equipment operations experience using mechanical, electrical, instrument or control system skills

**Employer Type:** Landfill Facilities, Consultants

**Related Careers:**

1. Landfill gas collection system technician

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## Geothermal Energy

The heat of the Earth is increasingly being harnessed to provide heat and electricity. In Colorado, ground source heat pumps are already being used to tap below ground temperatures for heating.<sup>42</sup> While Colorado currently has no geothermal projects that generate electricity, the 2008 action plan of the 'GeoPowering the West' Colorado State Working Group includes the goal of developing Colorado's first geothermal electricity production facility.<sup>43</sup> Developing Colorado's geothermal resources will help create new jobs and boost the economy of rural communities.<sup>44</sup>

### Geothermal Sheet Metal Worker

**Description:** Perform all operations necessary to make, install, and repair geothermal power generators

**Average Salary:** \$33,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended College Coursework:** Math, Mechanical Drawing, Metal shop, Welding, Heating and Air-Conditioning

**Experience Needed:** Entry to Mid-Level  
Journey level status

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Machinist
2. Welder

### Geothermal Heat Pump Machinist

**Description:** Make precision metal or plastic parts for geothermal heat pumps; use computer numerically controlled machine tools; set up and operate all of the basic machine tools and many specialized variations

**Average Salary:** \$31,000/year

**Min. Educational Req.:** Apprenticeship or Trade School

**Recommended College Coursework:** Metalworking, Drafting, Math, and Computer courses

**Experience Needed:** Entry to Mid-Level  
Journey level status

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Welder
2. Sheet Metal Worker

### Hydrogeologist

**Description:** Perform groundwater monitoring; collect water level measurements and water quality samples from production wells and monitoring wells

**Average Salary:** \$63,000/year

**Min. Educational Req.:** B.S. Degree in the field of geology, hydrogeology, earth science, or related field

**Recommended College Coursework:** Hydrogeology, Earth Sciences

**Experience Needed:** Entry-Level  
Some experience in groundwater sampling activities and hydrogeologic data presentation is a plus

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Water Purification Systems Service Technician

### Geothermal Power Plant Structural Engineer

**Description:** Design the geothermal power generating structure

**Average Salary:** \$67,000/year

**Min. Educational Req.:** Bachelor's Degree in Civil Engineering

**Recommended College Coursework:** Structural Engineering, Mechanical Systems, Geothermal

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
5 - 15 years of facility and industrial system design with 5 years of power plant design

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Civil Engineer

### Geothermal Plant Installation Technician

**Description:** Install geothermal projects

**Average Salary:** \$46,000/year

**Min. Educational Req.:** HS Diploma/GED

**Experience Needed:** Entry Level  
Experience in construction, refrigeration, electrical and/or plumbing installations

**Employer Type:** Private Firms, Power Plants/Facilities

**Related Careers:**

1. Systems Service Technician

### Geothermal Engineer

**Description:** Responsible for design, development and testing of all aspects of components, equipment and machinery

**Average Salary:** \$87,000/year

**Min. Educational Req.:** Bachelor's Degree in Mechanical Engineering

**Recommended College Coursework:** Mechanical Engineering, Electrical Engineering, Earth Sciences, Geothermal production

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
5 years with similar responsibilities

**Employer Type:** Private Firms, Government, Power Plants/Facilities

**Related Careers:**

1. Energy Engineer

### Geothermal Operations Engineer

**Description:** Collect and process information on well-field and plant performance, diagnose well problems and design procedures to fix them

**Average Salary:** \$69,000/year

**Min. Educational Req.:** Bachelor's degree or higher in Engineering

**Recommended College Coursework:** Resource/ Petroleum Engineering, Computer Programming,

**Certification:** Professional Engineer (P.E.)

**Experience Needed:** High Level  
15 years experience in geothermal resource engineering

**Employer Type:** Private Firms, Government, Power Plants/Facilities

### Geothermal Plant Efficiency Operator

**Description:** Responsible for maintaining and monitoring plant equipment for efficient and safe plant operations and planning and handling all hazardous materials and wastes in a safe and environmentally sensitive manner

**Average Salary:** \$52,000/year

**Min. Educational Req.:** HS Diploma/GED

**Certification:** HAZMAT certification

**Experience Needed:** High Level  
Minimum 5 years of power plant operating experience

**Employer Type:** Government, Power Plants/Facilities

**Related Careers:**

1. Weatherization Operations Manager

# Endnotes

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<sup>5</sup> Governor's Energy Office, Annual Report of the Governor's Energy Office Fiscal Year 2008 (July 1, 2007 – June 30, 2008): Advancing Colorado to a New Energy Economy, available at:

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<http://www.colorado.gov/energy/images/uploads/pdfs/23158d65cf0c2de7be220e35d1f7b72a.pdf>.

<sup>15</sup> Vestas press release, Vestas celebrates ground-breaking for two manufacturing facilities in Colorado (March 25, 2009), available at: <http://www.vestas.com/Default.aspx?ID=5481&M=News&NewsID=1170>.

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<sup>17</sup> Defining, Estimating, and Forecasting the Renewable Energy and Energy Efficiency Industries in the U.S. and Colorado.

<sup>18</sup> Hexcel, Corporation, Wind Energy, available at <http://www.hexcel.com/Markets/Wind>.

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